INSTRUCTIONS FOR OPERATING THE

NRI
PROFESSIONAL
MODEL 70

TUBE TESTER

NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

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INSTRUCTIONS FOR OPERATING THE NRI PROFESSIONAL TUBE TESTER, MODEL 70

The Model 70 NRI Professional Tube Tester is a modern, highly flexible emission type test instrument. It uses a Lever-type element distribution system which provides individual circuit control of each tube element. The Model 70 has been designed to afford a maximum of obsolescence-proof facilities.

This instrument is to be operated from ordinary power line voltage: It requires 110-120 volts AC, 50-60 cycles per second. DO NOT use on DC or on AC WITH FREQUENCIES OTHER THAN 50-60 cps. ALWAYS make sure of the kind of power before you plug in this instrument.

Description of the Panel:-

THE METER:- The Model 70 meter has two colored arcs. The upper main arc is used for all emission tests (including power rectifiers) with the exception of Diodes and di..e sections of multi-purpose tubes. Diode emission test is read on the lower colored arc labeled "Diodes".

THE SOCKETS:- To the left and right of the meter are the various types of sockets for all tubes to be tested. Select the proper socket to match the basing of the tube to be tested.

The universal grid-cap connector, (at the left of the meter) fits both the small octal size and standard size receiving tube grid caps. The connector MUST be attached to all tubes which have an overhead cap.

THE SELECTOR KNOBS AND LEVER SYSTEM:- Below the meter is a row of 4 knobs. The left hand knob labeled "Line" shuts the instrument off when the knob is fully turned to the left (pointing at "OFF"). This knob also permits you to adjust the voltages within the instrument to compensate for variations in your power line voltage.

The next knob, labeled "A, SENSITIVITY" adjusts the sensitivity of the meter. The setting of this control for each type of tube is listed on the roller chart under "A".

The next knob, labeled "B, FILAMENT" selects the proper filament voltage for each tube. The proper setting for each type of tube is listed on the chart under "B".

The last knob labeled "C, LOAD" selects the proper emission test voltage and load. This setting is listed on the chart under "C".

Each of the 10 numbered white levers (below the red and black knobs) correspond to the RTMA numbered base pins of the tube to be tested.

The position of these levers, labeled "D", "E" and "F" correspond to the following test circuits in the tester:-

"D" - Filament Return. Any lever thrown to "D" position throws its corresponding tube element to one connection of the transformer's filament winding. It is therefore obvious that only the filament pin of a tube would be thrown to position "D". The roll chart lists the proper lever nmeber under "D" over the roller chart window.

"E" --Open circuit position. Any lever thrown to "E" position open circuits its corresponding tube element. The roller chart lists the lever number (where necessary) under "E" over the roller chart window.

"F" Short/leakage, and emission test position. Any lever thrown to "F" position (WITHOUT DEPRESSING THE WHITE "PRESS TO READ" BUTTON) checks its corresponding tube element for shorts, or leakage. This test uses the neon bulb as the short/leakage indicator. This "F" row becomes the emission test row WHEN THE WHITE "PRESS TO READ" BUTTON IS DEPRESSED. The roller chart lists the lever numbere under "F" on the roller chart.

The "FIL., SHORT, LEAKAGE CHECKS" neon bulb, to the left of the white lever switches reveals filament continuity, shorts and leakages by an orange glow.

The "PRESS TO READ" button to the right of the lever switches is pressed for all emission readings.

The high speed roller chart is moved by spinning the geared wheel at the lower right corner of the panel.

Observe the following CAUTIONS carefully:

(1) Read this instruction booklet in detail before attempting to test tubes.

(2) ALWAYS be sure that ALL WRITE LEVERS are in the "COMMON" position before inserting a tube.

OPERATING PROCEDURE: (Follow in order listed)

(1) Plug the line cord into a 110-120 volt, 50-60 cycle electric outlet.

(2) Throw all white lever switches to the down, or "COMMON" position.

(3) Rotate the roll chart until you locate the tube type to be tested.

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(4) Set rotary selector switches "A", "B", and "C" to the position indicated on the roll chart under "A", "B", and "C" columns.

(5) Set the white lever switch corresponding to the number listed under column "D" on the roll chart to the "D" switch position.

(Do not as yet set lever switches indicated under "E" and "F" on the roll chart.)

(6) Insert the tube to be tested in its appropriate socket. (Attach the grid cap lead to the tube if it has a grid cap connection.)

LINE ADJUSTMENT:

(7) Rotate the "LINE" control clockwise from the "OFF" position, turning the instrument "ON". As you do so, you will note that the meter pointer will swing upscale, indicating the instrument is "ON". Adjust the "LINE" control until the meter pointer is directly over the "LINE" merker in the center of the meter scale.

LEAKAGE AND SHORT TEST:

(8) Throw each of the remaining levers one at a time from the "COMMON" position to the "F" position and back to the "COMMON" position. (Do not move the lever previously set in the "D" position.) A glow of the neon test lamp on any of these remaining levers (other than the lever or levers listed under the "FIL. CHECK" column) indicates a short or leakage condition between tube elements. Disregard any momentary neon flashes as levers are moved. NO FURTHER TESTS SHOULD BE PERFORMED ON ANY TUBE WHICH DOES NOT PASS THIS TEST.

FILAMENT CONTINUITY TEST:

When moving the lever, or levers, listed under the "FIL. CHECK" column on the roll chart, the neon test lamp should light. This indicates that the filament of the tube is good, If two numbers are listed in this column, this indicates that the tube has a tapped filument. Each lever should be moved individually from "COMMON" to "F" position and back again. Then both levers should be moved at the same time from the "COMMON" to "F" position and back again. Each of these two levers when moved separately and when moved together should cause the neon lamp to light when moved to the "F" position. (Especially important in testing types 35Z5, 35W4, and 35Y4.)

SPECIAL NOTES ON LEAKAGE AND SHORT TESTS:

(a) DISREGARD any momentary neon flashes as levers are moved. These flashes are merely the discharge of a condenser in the Short Check Circuit. (A bright glow on a leakage test indicates a direct short. A dim glow indicates an objectionable high resistance leakage condition.)

(b) There are some tubes which should show short when certain levers in addition to those listed under the "FIL. CHECK" column are moved from the "COMMON" position to the "F" position. Special notations follow tube test data given for these tubes.

(c) In actual practice (for short test) it is only necessary to move those levers corresponding to the number of elements in a tube. For example, for a tube with four pins, only levers 1 through 4 need be moved. (If in doubt, move all levers other than those in position "D".) For tubes having a grid cap connector, also use lever No. 0. Lever numbers stand for the standard RTMA pin numbers.

EMISSION TEST:

(9) (a) If the tube has passed the "short" test, move those levers listed under the "E" column (if any) to the "E" switch position and those levers under the "F" column to the "F" switch position. (The "D" lever should remain as set in Step 5. Other levers remain in the "COMMON" position.) Press the white "PRESS TO READ" button firmly as far down as it will readily go and read the tube's emission rating on the meter.

(b) IMPORTANT NOTE - All diodes (other than power rectifier types) and diode sections of multi-purpose tubes are checked on the lower narrow 2-colored arc on the meter labeled "Diodes". When this scale is to be read, a † appears before the word "Diode" on the roll chart.

(10) Rotate "LINE" control counter-clockwise to 'OFF" position and place all levers in "COMMON' position before testing the next tube.

* * * * * * * *

SPECIAL NOTES ON FILAMENT CONTINUITY TESTS:

The flexible element selection circuit of the Model 79 allows for either series or parallel connection of center-tapped filaments. In order to obtain uniformity of test settings and to minimize operating errors, all tubes with center-tapped filaments are tested in parallel connec-

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tion. Should the neon lamp fail to glow when any one of the levers (listed on the roller chart under "FIL. CHECK") are actuated during the "FIL. CHECK" test, the tube should be discarded.

If, however, one section of a center-tapped filament be indicated to be open-circuited, and for some reason the operator does perform a Quality test, it will be found in many cases that a reading in the upper section of the red, "REPLACE" sector can be obtained. This is, of course, due to the parallel filament connection. The intact portion of the filament is still operating and causing a partial meter reading to be obtained. Such tubes should have been previously discarded as the result of the "FIL. CHECK" test failure.

Certain tubes such as types 35Z5, 35Y4, and 35W4 also have a tapped filament. This tap is provided for connecting a 6.3 volt pilot lamp in parallel with part of the filament, and therefore the tap does not occur at the center of the filament. In testing these tubes, it is particularly important to carefully observe the result of the FILAMENT CONTINUITY tests as described in Step 8 of the operating procedure.

Certain tubes, such as type 117Z3, require that the "B - Filament' control be set back to 8 during the "FILAMENT CONTINUITY" check. This is indicated by a dot appearing beside the number under the "Fil. Check" column. After the "FILAMENT CONTINUITY" test has been made, return the "B - Filament" control to its proper setting before making the "EMISSION TEST."

TESTING MULTI-PURPOSE TUBES:

Some multi-purpose tubes have more than one section, such as a triode section and two diode sections. A type 6AQ6 is an example. For such tubes a separate list of settings is given for each section of the tube. The standard leakage and short test checks every element for leakage, filament continuity and shorts irrespective of the number of elements or sections, and need not be repeated for each section of the tube. However the emission check should be made for each row of settings on the roller chart.

OPEN ELEMENT TESTS: Usually not performed unless this uncommon trouble is suspected.

Should the Cathode or Control grid of a tube to be tested be open circuited within the tube (an unusual occurrence) a "REPLACE" indication will automatically be obtained during the Emission Test. Should the relatively rare condition of an open circuited Screen or plate, etc. occur, the condition may be ascertained during the Emission Test by holding the white push button down and individually throwing the levers under "F" position to the "E" position. If an element is open circuited NO movement of the meter pointer will be noted as its corresponding numbered lever is actuated. If the element is OK (not open circuited) a slight difference in the meter reading will be obtained as the lever is thrown from position "F" to "E".

SPECIAL ROLLER CHART NOTATIONS

"EYE TEST" (electron ray type indicator tubes)

Single Target Type. This type is typified by types 6E5 and 6G5: For example a roller chart line for type 6E5 appears as follows:

TUBE		A	B	C	D	E	F	Fil. Check
6E5	Eye	0	7	4	1	-	2-4	-

The following test procedure must be employed: After performing the standard "SHORT" and "EMISSION" test for the triode section, set all switches and levers as indicated on the roller chart for the "eye" test. Depress the white "Push" button and observe the circular fluorescent screen which should illuminate completely.

Next, throw the FIRST of the two levers indicated under the "F" lever setting (in this example, Lever 2) to the "COMMON" position. (While still depressing the white "push" button.)

A good tube will now exhibit a typical angular shadow. Return the same first lever to its original "F" position and note closure of the shadow angle. DISREGARD METER INDICATIONS.

"Double Target Type" (Twin electron ray indicator tubes)

This type is typified by type 6AF6 and 6AD6; for example: a typical roller chart line for type 6AD6 appears as follows:

TUBE		A	B	C	D	E	F	Fil. Check
6AD6	Eye	0	7	4	2	-	3-4-5	7

The following test procedure must be employed:

After performing the standard 'SHORT CHECK", set all switches and levers as indicated on the roller chart.

Depress the white push-button and observe the circular fluorescent screen which should illuminate completely.

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Next, with button still depressed, throw the FIRST of the three levers under the "F" settings (in this example, lever 3) to the "COMMON" position. A good tube will now exhibit a typical angular shadow.

Next, with button still depressed, throw the SECOND of the three levers under the "F" settings (in this example, lever 4) to the "COMMON" position. The tube, if good will exhibit another angular shadow opposite the position occupied by the first shadow. DISREGARD METER INDICATIONS.

FM/AM Tests: (Tuning indicator tubes). This type of electron ray tube is typified by type 6AL7 and is tested simply and positively through virtue of the flexibility of the Model 70.

Test procedure is as follows:

After performing the standard "SHORT" test set all levers and switches as indicated on the roller chart including the lever numbers listed in the parenthesis.

Depress the white push-button and observe the two rectangular fluorescent patterns on the screen of the tube.

With the white "push-button" depressed throw Lever No. 4 from its "D" position to "E" position. One rectangular pattern should become slightly shorter in length.

Next, with button still depressed, throw Lever No. 6 from its "D" position to "E" position. The other rectangular pattern should then become shorter in length.

Next, with button still depressed, throw Lever No. 5 from its "D" position to "E" position. Both ends of the pattern (opposite the ends noted above) should then slightly decrease in length. Observe these ends closely as the movement may be slight.

SPECIAL RECTIFIER TEST (types 70A7, 117N7 and 117P7)

Because of the unusual internal connections (plate tied to one side of filament) the 70A7, 117N7 and 117P7 RECTIFIER sections require slightly special test procedures.

70A7 - RECTIFIER SECTION. Set all controls and lever 2 in accordance with the roller chart. AFTER THE TUBE HAS HEATED SUFFICIENTLY throw BOTH levers 2 and 7 rapidly to "E" position and then lever 6 rapidly to "F" position - then quickly depress the white push button. The first meter deflection obtained is the significant reading, inasmuch as the meter reading will quickly recede as a result of cooling of the heater.

117N7 and 117P7 - RECTIFIER SECTION. Set all controls and lever 2 in accordance with the roller chart. All levers, with the exception of lever 2, must be in "COMMON" position. AFTER THE TUBE HAS HEATED SUFFICIENTLY, throw lever 2 rapidly to "E" position AND lever 7 rapidly to "F" position, then quickly depress the white push-button. The first meter deflection obtained is the significant reading, inasmuch as the meter reading will quickly recede as a result of cooling of the heater.

SPECIAL SHORT INDICATION NOTES. Listings for several tubes on the roller chart bear notes indicating that certain tubes "Must Show Short" on one or more levers in addition to the "FIL. CHECK" numbers. For normal usage any tube which does not show short on the designated levers should be considered a defective tube.

However due to multiple terminations of elements in many modern tubes, certain of these tubes may be salvaged for specific applications wherein the exact circuit application is known. Two of these cases are noted as follows:

a) Tubes with negative filament connection terminating in 2 base pins. Should one of the two base pin connections become open, the tube may be salvaged and the remaining pin may be used for negative filament termination only if the radio or electronic circuit will allow the use of that pin or BOTH pins.

b) Tubes with an element such as plate, grid, etc. terminating at two or more base pins. Again, if one terminating pin remains connected to the element, the tube may be salvaged if the electronic circuit will allow the use of that pin and does not require the use of the open-circuited base pin or BOTH pins.

Gas Type Rectifiers 0Y4, 0Z3 and 0Z4

When testing these gas rectifier types, it will be noted that the meter pointer will remain, for a short interval, in the "REPLACE" sector and then deflect rapidly into the "GOOD" sector. This condition is normal for a good gas rectifier. However, should the meter pointer remain constantly in the "REPLACE" sector (after the lapse of several seconds), then the gas rectifier should be rejected.

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SUB-MINIATURE TUBE TESTS:

The sub-miniature type of vacuum tube, (typified by types 1C8 and 2S31) employs closely spaced flexible leads for element terminations in contrast to standard rigid pin basing. In addition, two bulb shapes are in production: The ROUND type with lead terminations arranged circularly, and the FLAT type with lead terminations arranged in one linear plane. Considering this condition and the fact that many subminiature types are directly soldered in operating circuits, with leads cut to varying lengths, NRI offers a simple but FLEXIBLE AND UNIVERSAL sub-miniature tube test adapter unit with flexible leads and positive contact clips. This adapter unit permits positive connection of sub-miniature tubes with maximum facility regardless of lead length variations, and with a minimum possibility of inter-lead shorting. See Fig. 1. This adapter, is available as a seperate optional item. Price $1.00. Order "SUBMINIATURE ADAPTER FOR MODEL 70".

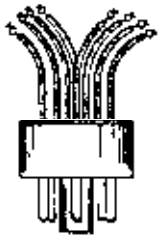

FIG 1

SUBMINIATURE ADAPTER

NOTE re TYPE 1X2

1X2 - "Filament Termination Check" - If one or more of the multiple filament base terminations of the 1X2 should become open-circuited (a rare occurrence) the Model 70 will reveal this condition thru use of the following test procedure:

After the regular Fil. Check and emission tests are completed for this tube throw ALL levers INCLUDING levers 2, 5 and 8 to the "COMMON" position. Then throw Levers 1, 2, 4, 5, 6, 8 and 9 INDIVIDUALLY to "F" position and then back to "COMMON". Neon glow should be obtained on each of these levers.

SUPPLEMENTAL TUBE TEST DATA INCLUDED WITH YOUR INSTRUMENT:

Mechanical design of the roll chart in the Model 70 physically limits the number of tubes which can be listed on the chart. Also, the elimination of seldom tested tube types means faster and more efficient operation of the instrument. Therefore, we have included a seperate supplemental list of seldom tested tubes which you may use as needed when testing these less comaon types.

WARRANTY

Your tube tester carries a standard 90 day RTMA warranty. Write to NRI in case of any trouble. Give complete details. Do not return instrument to NRI without our authorization.

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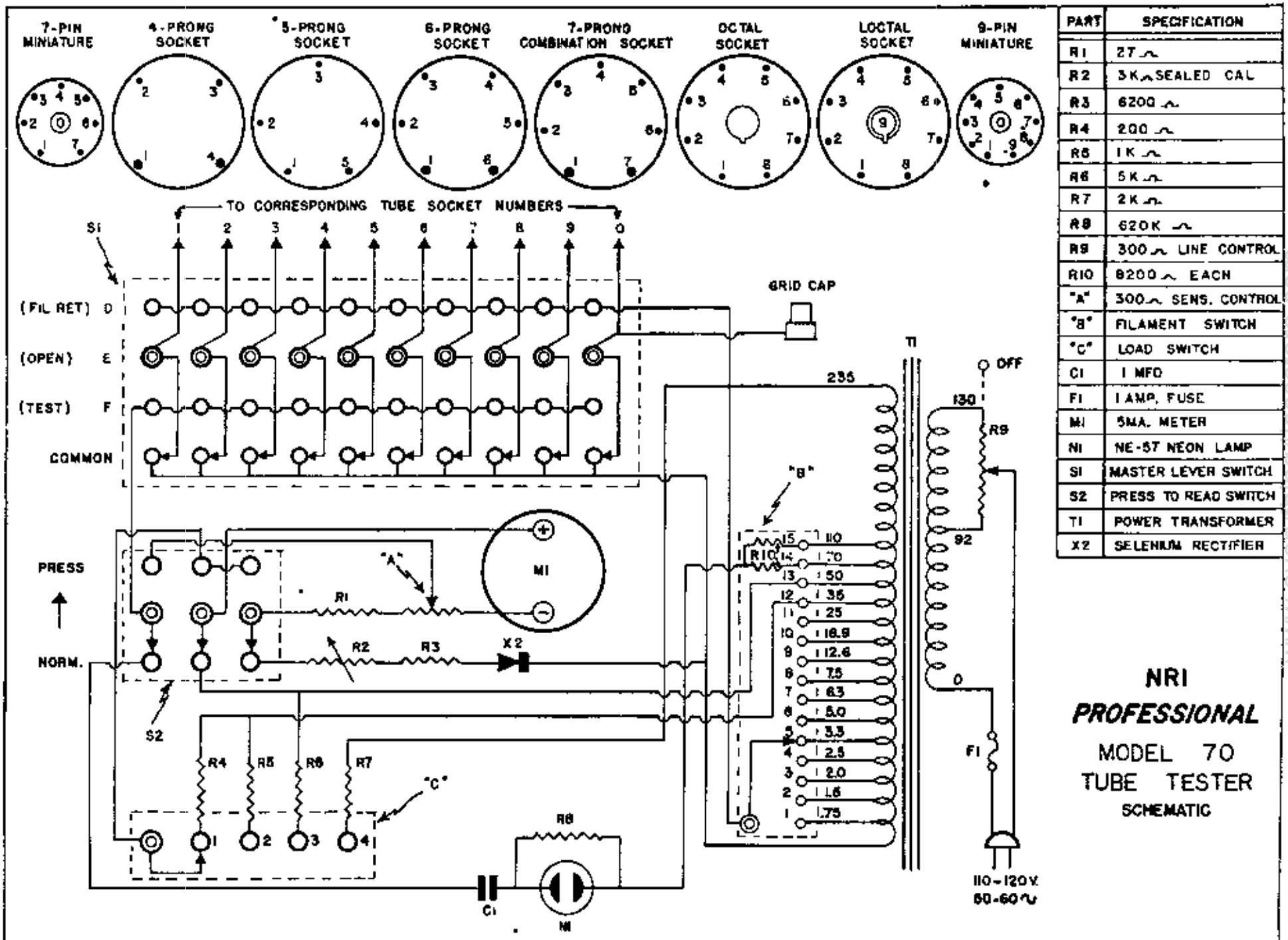

PART	SPECIFICATION
R1	27 Ω
R2	3K Ω SEALED CAL
R3	6200 Ω
R4	200 Ω
R5	1K Ω
R6	5K Ω
R7	2K Ω
R8	620K Ω
R9	300 Ω LINE CONTROL
R10	8200 Ω EACH
"A"	300 Ω SENS. CONTROL
"B"	FILAMENT SWITCH
"C"	LOAD SWITCH
C1	1 MFD
F1	1 AMP. FUSE
M1	5MA. METER
N1	NE-57 NEON LAMP
S1	MASTER LEVER SWITCH
S2	PRESS TO READ SWITCH
T1	POWER TRANSFORMER
X2	SELENIUM RECTIFIER

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